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Constraining recent Shiveluch volcano eruptions (Kamchatka, Russia) by means of dendrochronology

I. Pavlova (1), O. Solomina (1), G. Jacoby (2), A. Curtis (2), V. Ponomareva (3), M. Pevsner (3)

(1) Institute of Geography RAS, Moscow, Russia, (2) Lamont-Doherthy Earth Observatory, NY, USA, (3) Geological Institute, RAS, Moscow, Russia (socloseandsofar@yahoo.com / Fax: +007-495-1259011)

Shiveluch (N 56˚38', E 161˚19'; elevation: active dome ∼2,500 m, summit of Old Shiveluch 3,283 m) is one of the most active volcanos in Kamchatka. The eruptions of Shiveluch commonly result in major environmental destructions caused by debris avalanches, hot pyroclastic flows, tephra falls and lahars. The constraining these events in time and space is important for the understanding and predictions of these natural hazards. The last big eruption of Shiveluch occurred in 2005; earlier ones, dated by instrumental, historical, 14C and tephrochronological methods, occurred in the last millennium around AD 1030, 1430, 1650, 1739, 1790-1810, 1854, 1879-1883, 1897-1898, 1905, 1927-1929, 1944-1950, and 1964. A lava dome has been growing in the 1964 crater since 1980, occasionally producing tephra falls and pyroclastic flows. Several recent eruptions of Shiveluch (∼AD1050, 1650, 1854, 1964) may have been climatically effective and probably are recorded in the Greenland ice cores.

Most dates for eruptions before AD1854 are obtained by tephrochronology and constrained by radiocarbon dating with an accuracy of several decades or centuries. In this paper we report about the tree-ring dates for two recent pyroclastic flows in Baidarnaia and Kamenskaia valleys. Though the wood buried in these deposits is carbonized, fragile and poorly preserved, we were able to measure ring width using standard tree-ring equipment or photographs and cross-date these samples against the regional Kamchatka larch ring width chronology. The dates of the outer rings indicate the date of the eruptions. In the Baidarnaia valley it is AD1756. This date coincides with the

decrease of ring width at Shiveluch volcano in comparison with the control “non volcanic” chronology. The inner part of wood buried in the pyroclastic flow dates back to around AD1640 (no later than AD1648); this date provides the limiting age for an older eruption. The pyroclastic flow in Kamenskaia valley, although looking very similar to the one in Baidarnaia valley yielded one century older age (AD 1648). The date also coincides with the ring width decrease in AD1644-1649. The oldest inner ring of the buried trees in the pyroclastic flow dates back to AD1588. The dates generally agree with the tephrochronological findings, and further constrain the chronology of volcanic events in this remote area.